

Science Collaborative Progress Report for the Period 03/01/13 through 08/31/13

Project Title: Determining the role of estuarine 'swashes' on water quality impairment along the Grand Strand of South Carolina: Impacts of land use and stormwater runoff.

Principal Investigator(s): Dr. Erik M. Smith

Project start date: September 15, 2010

Report compiled by: Dr. Erik M. Smith

Contributing team members and their role in the project:

Dr. Denise M. Sanger – Integration Co-lead

M. Richard DeVoe – Integration Co-lead

Michelle LaRocco – Local Outreach Facilitation

Dr. Susan Libes – Research Co-PI

Dr. Richard Viso – Research Co-PI

Dr. Richard Peterson – Research Co-PI

Dr. Jennifer Plunket – Research Co-PI

A. Progress overview: The overall project goal is to address how land use attributes and stormwater management practices and conveyance within swash watersheds affect nutrient and organic matter loading to those swashes, their internal transformations, and subsequent export to the coastal ocean. The ultimate intent is to enable effective management strategies, based on sound science, that improve and protect coastal water quality, particularly with respect to hypoxia, in Long Bay. To do so, the following key project objectives have been identified: 1) Work with intended users to define and develop a categorization scheme for all 14 swashes and select 4 swashes for intensive investigation during the proposed study; 2) Quantify concentrations and forms of nutrient and organic matter entering swashes via surface water and groundwater inputs; 3) Determine internal conditions and processes affecting organic matter transport and transformations in swashes; 4) Quantify the form and net tidal export of nutrients and organic matter from swashes; 5) Engage intended users to enable use of data to collaboratively develop science-based cost-effective management strategies.

During this reporting period all planned progress on achieving Objectives 2, 3 and 4 was accomplished. Since the last project workshop between researchers and intended users resulted in a collective decision to maintain sampling efforts in the Year 1 study sites, rather than switching the research to two new swashes (as detailed in previous progress reports), data collection and sample processing for the two Year 1 study swashes continued as planned and is currently ongoing.

B. Working with Intended Users: Maintaining a strong relationship with participating municipalities is a key success component to the NERRS Science Collaborative Swash Project, especially since the results are intended to eventually help inform planning and engineering solutions. Since the beginning of the project, local decision-makers, coastal resource managers, and researchers have been brought together to help define the problem and assist with project implementation.

During this reporting period, the final watersheds for the 15 swashes and subwatersheds for the two study swashes as well as watersheds for the beach and ocean outfall pipes were provided to the intended user group for review. This included a document summarizing the methodology and sizes of all of the watersheds/subwatersheds and GIS shapefiles. The intended users reviewed the information and provided input on the watershed/subwatershed delineations. This was a critical step to ensure that an area without digital information would not result in an incorrect delineation. For example, one watershed was enlarged to include a commercial

development. The intended users were also updated with regard to the overall progress of the project.

During the current reporting period Leigh Wood, who served as the point person for local outreach resigned as the NI-WB NERR Coastal Training Program (CTP) Coordinator. Leigh left the NI-WB NERR to work with the Horry County Planning Department as a Senior Planner. We are looking forward to engaging Leigh as an intended user to keep her involved in the project. The NI-WB NERR has hired a new CTP coordinator, Michelle LaRocco, who is looking forward to becoming engaged in the project.

C. Progress on project objectives for this reporting period:

The following five key project objectives were identified for the project: 1) Work with intended users to define and develop a categorization scheme for all 14 swashes and select 4 swashes for intensive investigation during the proposed study; 2) Quantify concentrations and forms of nutrient and organic matter entering swashes via surface water and groundwater inputs; 3) Determine internal conditions and processes affecting organic matter transport and transformations in swashes; 4) Quantify the form and net tidal export of nutrients and organic matter from swashes; 5) Engage intended users to enable use of data to collaboratively develop science-based cost-effective management strategies.

The first objective was completed as proposed during earlier reporting periods (see Progress Reports from August 2011 and September 2012). The second, third and fourth objectives are all related to sampling the inputs, internal processes and outputs from the swashes. Through the end of the current reporting period, a total of 34 sampling events have been conducted between the two study swashes (Table 1). With the dry event sampling of August 28-29, we will have completed all planned sampling in the Withers Swash basin. A final set of rain- and dry-event sampling in the Dogwood Swash basin is planned for September. Upon completion of this planned sampling in Dogwood, all field work associated with the project will be complete.

During the current reporting period, as with past reporting periods, estimates of water discharge (via ADCP measurements in Withers and water level over spillway in Dogwood) and swash water temperature, conductivity, dissolved oxygen, turbidity and chlorophyll fluorescence (via YSI sonde deployment) have been made semi-continuously. On each sampling event, grab samples were collected (via ISCO automated samplers) for concentrations of nitrogen and phosphorus (in all forms), dissolved organic carbon, particulate organic carbon, total suspended sediments, and chlorophyll a were made in surface waters of each of the upstream sampling stations as well as in the main swash body. On each sampling event, ground water samples were collected for concentrations of dissolved nitrogen and phosphorus (in all forms), and dissolved organic carbon, at each of the upstream sampling stations as well as at the main swash body discharge site. Nearly continuous measurements of Rn-222 were made in surface waters at both the Wither and Dogwood swash mouth sites, while discreet grab-samples for Rn-222 were collected from groundwater wells at mouth and each upstream site during dry and wet sampling events. In addition, weekly grab sample of surface waters for Rn-222 at each upstream site were collected. Measurements of water column primary production and community respiration were also made in the main swash body. Rainfall amounts and storm hydrographs were collected at each of the upstream events during each rain event sampling. Analytical processing for all of the above sampling is currently in progress. Periodic manual water velocity measurements at all upstream sampling stations with a hand-held Sontek Flowtracker continued during the current reporting period to overcome the discovered limitations of the in situ ISCO flow meters in accurately quantifying water velocity at the low flows experienced in these systems. Since the ISCO flow meters are doing an good job measuring

water level, but a poor job resolving flow rates, we now intend to develop empirical relationships between level and water velocity (from Flowtracker measurements) at each upstream station to use in determining total water discharge and nutrient/organic matter fluxes.

In addition, watershed boundaries have been identified for all of the watersheds (i.e., swash, ocean and beach-front outfalls) along the Grand Strand (Figure 1) and for the headwater study site sub-watersheds (Figures 2 and 3). The watersheds will be used to evaluate land use/land cover, impervious cover, stormwater ponds, and other landscape features within each watershed. The watersheds will also be used to model the stormwater runoff and loadings for each watershed. The watersheds were developed from watershed boundaries and other pertinent layers (e.g., pipes, ditches, Lidar, land cover) provided by the Town of Surfside, City of Myrtle Beach, City of North Myrtle Beach, and Horry County.

The fifth objective is a continuing process which will evolve throughout the project. The interactions discussed above with the Intended Users and other audiences are all important steps toward this objective.

Plans for meeting project objectives for the next six months entail completing field sampling and data collection by the end of September 2013, completing analytical processing of archived samples (i.e., those samples without restrictive holding times [e.g., particulate and dissolved organic carbon samples]), completing data analyses and data syntheses, convening a research PI meeting to merge datasets and data syntheses, convening a final project workshop between researchers and intended users to disseminate and vet research results and then discuss next steps and outcomes resulting from the research.

D. Benefit to NERRS and NOAA: None during the current reporting period.

E. Other: None during the current reporting period.

Table 1. Sampling events for each swash by type of event through the current reporting period.

SWASH	EVENT TYPE	EVENT DATE	EVENT #
Withers	Dry	July 7-8, 2011	1
Withers	Rain	July 24-25, 2011	2
Dogwood	Rain	August 13-14, 2011	3
Dogwood	Dry	September 13-14, 2011	4
Withers	Dry	October 4-5, 2011	5
Withers	Rain	October 10-11, 2011	6
Dogwood	Rain	November 16-17, 2011	7
Dogwood	Dry	December 11-12, 2011	8
Withers	Dry	January 2-3, 2012	9
Withers	Rain	January 11-12, 2012	10
Dogwood	Dry	January 31, 2012-February 1, 2012	11
Dogwood	Rain	February 18-19, 2012	12
Withers	Rain	March 24-25, 2012	13
Withers	Dry	April 11-12, 2012	14
Dogwood	Dry	May 1-2, 2012	15
Dogwood	Rain	May 9-10, 2012	16
Withers	Rain	May 30-31, 2012	17
Withers	Dry	June 25-26, 2012	18
Dogwood	Dry	July 16-17, 2012	19
Dogwood	Rain	August 7-8, 2012	20
Withers	Rain	August 28-29, 2012	21
Withers	Dry	September 23-24, 2012	22
Dogwood	Dry	October 17-18, 2012	23
Dogwood	Rain	November 15-16, 2012	24
Withers	Dry	January 6-7, 2013	25
Withers	Rain	February 7-8, 2013	26
Dogwood	Rain	March 13-14, 2013	27
Dogwood	Dry	April 9-10, 2013	28
Withers	Rain	April 29-30, 2013	29
Withers	Dry	May 15-16, 2013	30
Dogwood	Rain	June 3-4, 2013	31
Dogwood	Dry	July 9-10, 2013	32
Withers	Rain	August 15-16, 2013	33
Withers	Dry	August 28-29, 2013	34
Dogwood	TBD	TBD	35
Dogwood	TBD	TBD	36

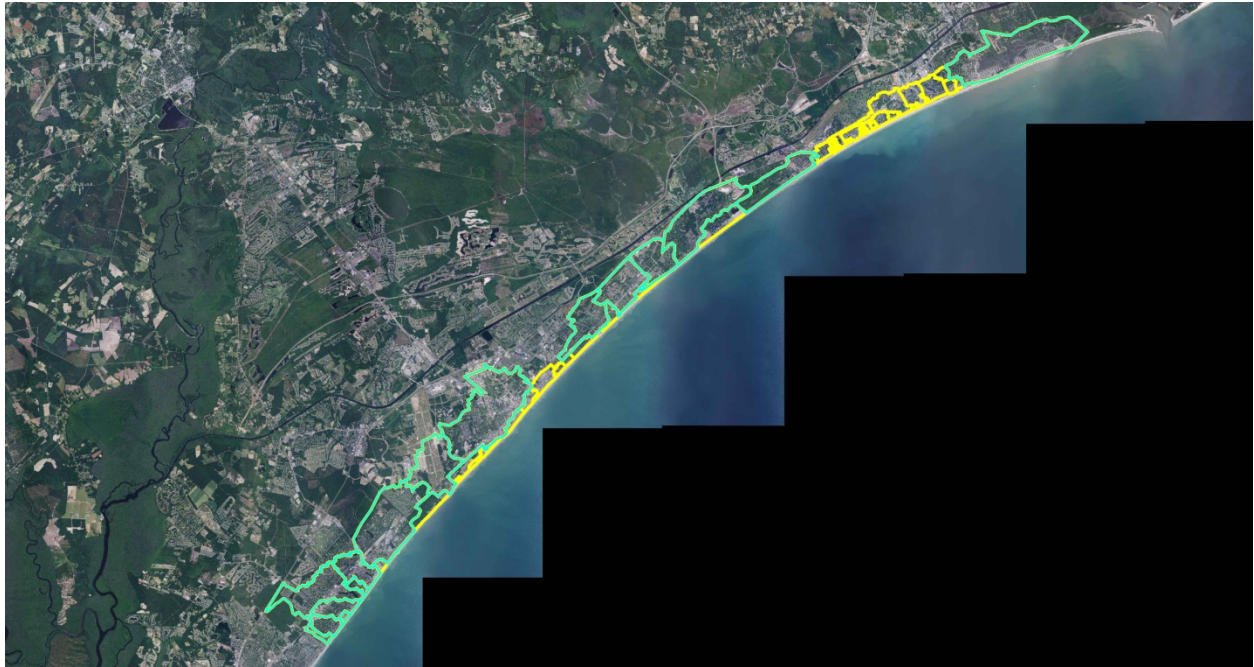


Figure 1. The full extent of the Grand Strand with the watersheds identified in green (Swashes) and pipes/unknown in yellow.

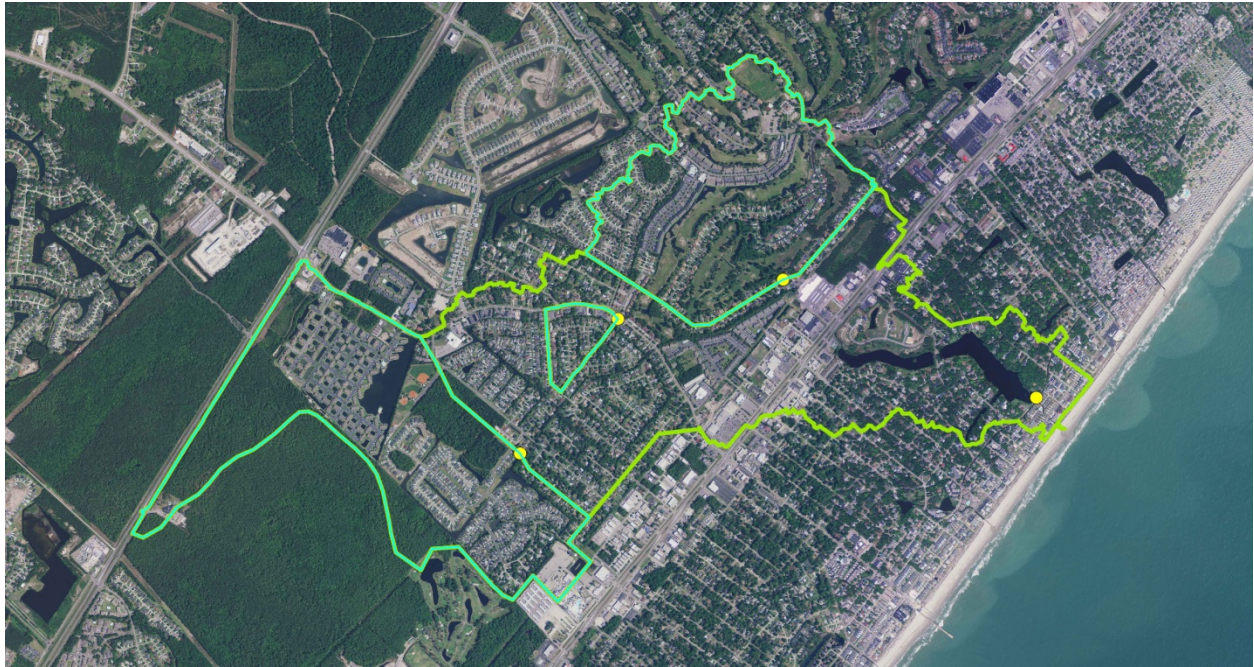


Figure 2. The Dogwood Swash watershed is the full extent with three sub-watersheds shown in the mint green. Yellow circles indicate the sampling locations.



Figure 3. The Withers Swash watershed is the full extent with three sub-watersheds shown in the mint green. Yellow circles indicate the sampling locations.